

CLAIMS

What is claimed is:

1 1. A method for providing a graphical image on a display of a system, the
2 graphical image being provided from data describing a plurality of primitives, the display
3 including a plurality of pixels, the method comprising the steps of:

4 (a) providing a plurality of variable-sized bins containing the plurality of
5 primitives; and

6 (b) rendering the plurality of primitives by rendering each of the plurality of
7 variable-sized bins variable-sized bin by variable-sized bin.

1 2. The method of claim 1 wherein the system includes a plurality of processors
2 for processing a portion of the plurality of primitives in parallel, and wherein the variable-
3 sized bin providing step (a) further includes the steps of:

4 (a1) storing the plurality of primitives in a plurality of bins;

5 (a2) determining if a part of a portion of the plurality of bins can be combined
6 without causing the plurality of processors to overflow; and

7 (a3) combining the part of the portion of plurality of bins to provide the plurality
8 of variable-sized bins if the part of the portion of the plurality of bins can be combined
9 without causing the plurality of processors to overflow;

10 wherein the plurality of variable-sized bins can include fewer bins than the plurality
11 of bins.

1 3. The method of claim 2 wherein the combining step (a3) further includes the
2 steps of:

3 (a3i) combining the part of the portion of the plurality of bins so that a particular
4 primitive of the plurality of primitives is provided only once for a corresponding variable-
5 sized bin of the plurality of variable-sized bins.

1 4. The method of claim 2 wherein the variable-sized bin providing step (a)
2 further includes the steps of:

3 (a4) providing a display list containing the plurality of primitives, the display list
4 including the plurality of primitives ordered according to the plurality of variable-sized bins,
5 wherein a particular primitive of the plurality of primitives is provided to the display list
6 only once for a corresponding variable-sized bin of the plurality of variable-sized bins.

1 5. The method of claim 2 wherein each of the plurality of bins includes a first
2 boundary, wherein each of the plurality of primitives intersects a second portion of the
3 plurality of bins, and wherein the storing step (a1) further includes the step of:

4 (a1i) storing each of the plurality of primitives in the second portion of the
5 plurality of bins based on whether the first boundary is crossed.

1 6. The method of claim 5 wherein each of the plurality of primitives includes a
2 minimum y value, a top scan line, and bottom scan line, and wherein the storing step (a1)
3 further includes the step of:

4 (a1ii) storing each of the plurality of primitives in the second portion of the

5 plurality of bins in an order based on the minimum y value; and

6 (a1iii) storing the top scan line and the bottom scan line for each of the plurality of
7 primitives in the second portion of the plurality of bins.

1 7. The method of claim 1 wherein the variable-sized bin providing step (a)
2 further includes the steps of:

3 (a1) determining a plurality of bins for a previous frame; and

4 (a2) providing the plurality of bins containing the plurality of primitives.

1 8. The method of claim 7 wherein the system further includes a plurality of
2 processors for processing a portion of the plurality of primitives in parallel and wherein the
3 variable-sized bin providing step (a) further includes the step of:

4 (a3) storing the plurality of primitives in the plurality of bins;

5 (a4) determining if a part of a portion of the plurality of bins can be combined
6 without causing the plurality of processors to overflow; and

7 (a5) combining the part of the portion of the plurality of bins to provide the
8 plurality of variable-sized bins if the part of the portion of the plurality of bins can be
9 combined without causing the plurality of processors to overflow;

10 wherein the plurality of variable-sized bins can include fewer bins than the plurality
11 of bins.

1 9. The method of claim 8 wherein the combining step (a5) further includes the
2 steps of:

3 (a5i) combining the part of the portion of the plurality of bins so that a particular
4 primitive of the plurality of primitives is provided only once for a corresponding variable-
5 sized bin of the plurality of variable-sized bins.

1 10. The method of claim 8 wherein the variable-sized bin providing step (a)
2 further includes the steps of:

3 (a6) providing a display list containing the plurality of primitives, the display list
4 including the portion of the plurality of primitives for each of the plurality of variable-sized
5 bins ordered variable-sized bin by variable-sized bin, wherein a particular primitive of the
6 plurality of primitives is provided to the display list only once for a corresponding variable-
7 sized bin of the plurality of variable-sized bins.

1 11. The method of claim 7 wherein the system further includes a plurality of
2 processors for processing a portion of the plurality of primitives in parallel and wherein the
3 variable-sized bin providing step (a) further includes the step of:

4 (a3) determining if a portion of the plurality of bins causes the plurality of
5 processors to overflow; and

6 (a4) splitting each bin of the portion of the plurality of bins into two bins.

1 12. The method of claim 1 wherein a second portion of the plurality of primitives
2 intersects each of a portion of the plurality of variable-sized bins, wherein the plurality of
3 primitives include a plurality of fragments intersecting each pixel of a portion of the plurality
4 of pixels and wherein the rendering step (b) further includes the steps of:

5 (b1) rendering each of the plurality of variable-sized bins pixel by pixel in raster
6 order, the plurality of fragments being provided pixel by pixel for the portion of the plurality
7 of pixels.

1 13. A computer-readable medium containing a program for providing a graphical
2 image on a display of a system, the graphical image being provided from data describing a
3 plurality of primitives, the display including a plurality of pixels, the program including
4 instructions for:

5 (a) providing a plurality of variable-sized bins containing the plurality of
6 primitives; and

7 (b) rendering the plurality of primitives by rendering each of the plurality of
8 variable-sized bins variable-sized bin by variable-sized bin.

1 14. The computer-readable medium of claim 13 wherein the system includes a
2 plurality of processors for processing a portion of the plurality of primitives in parallel, and
3 wherein the variable-sized bin providing instructions (a) further includes instructions for:

4 (a1) storing the plurality of primitives in a plurality of bins;

5 (a2) determining if a part of a portion of the plurality of bins can be combined
6 without causing the plurality of processors to overflow; and

7 (a3) combining the part of the portion of the plurality of bins if the portion of
8 plurality of bins can be combined without causing the plurality of processors to overflow;

9 wherein the plurality of variable-sized bins can include fewer bins than the plurality
10 of bins.

1 15. The computer-readable medium of claim 14 wherein the combining
2 instructions (a3) further includes instructions for:

3 (a3i) combining the part of the portion of the plurality of bins so that a particular
4 primitive of the plurality of primitives is provided only once for a corresponding variable-
5 sized bin of the plurality of variable-sized bins.

1 16. The computer-readable medium of claim 14 wherein the variable-sized bin
2 providing instructions (a) further includes instructions for:

3 (a4) providing a display list containing the plurality of primitives, the display list
4 including the plurality of primitives ordered according to the plurality of variable-sized bins,
5 wherein a particular primitive of the plurality of primitives is provided to the display list
6 only once for a corresponding variable-sized bin of the plurality of variable-sized bins.

1 17. The computer-readable medium of claim 14 wherein each of the plurality of
2 bins includes a first boundary, wherein each of the plurality of primitives intersects a second
3 portion of the plurality of bins, and wherein the storing instructions (a1) further includes
4 instructions for:

5 (a1i) storing each of the plurality of primitives in the second portion of the
6 plurality of bins based on whether the first boundary is crossed.

1 18. The computer-readable medium of claim 17 wherein each of the plurality of
2 primitives includes a minimum y value, a top scan line, and bottom scan line, and wherein
3 the storing instructions (a1) further includes instructions for:

4 (a1ii) storing each of the plurality of primitives in the second portion of the
5 plurality of bins in an order based on the minimum y value; and

6 (a1iii) storing the top scan line and the bottom scan line for each of the plurality of
7 primitives in the second portion of the plurality of bins.

1 19. The computer-readable medium of claim 13 wherein the variable-sized bin
2 providing instructions (a) further includes instructions for:

3 (a1) determining a plurality of bins for a previous frame; and

4 (a2) providing the plurality of bins containing the plurality of primitives.

1 20. The computer-readable medium of claim 19 wherein the system further
2 includes a plurality of processors for processing a portion of the plurality of primitives in
3 parallel and wherein the variable-sized bin providing instructions (a) further includes
4 instructions for:

5 (a3) storing the plurality of primitives in the plurality of bins;

6 (a4) determining if a part of a portion of the plurality of bins can be combined
7 without causing the plurality of processors to overflow; and

8 (a5) combining the part of the portion of the plurality of bins if the part of the
9 portion of the plurality of bins can be combined without causing the plurality of processors
10 to overflow;

11 wherein the plurality of variable-sized bins can include fewer bins than the plurality
12 of bins.

1 21. The computer-readable medium of claim 20 wherein the combining
2 instructions (a5) further includes instructions for:

3 (a5i) combining the part of the portion of the plurality of bins so that a particular
4 primitive of the portion of the plurality of primitives is provided only once for a
5 corresponding variable-sized bin of the plurality of variable-sized bins.

1 22. The computer-readable medium of claim 20 wherein a portion of the plurality
2 of primitives intersect each of a second portion of the plurality of variable-sized bins and
3 wherein the variable-sized bin providing instructions (a) further includes instructions for:

4 (a6) providing a display list containing the plurality of primitives, the display list
5 including the portion of the plurality of primitives for each of the plurality of variable-sized
6 bins ordered variable-sized bin by variable-sized bin, wherein a particular primitive of the
7 portion of the plurality of primitives is provided to the display list only once for a
8 corresponding variable-sized bin of the plurality of variable-sized bins.

1 23. The computer-readable medium of claim 19 wherein the system further
2 includes a plurality of processors for processing a portion of the plurality of primitives in
3 parallel and wherein the variable-sized bin providing instructions (a) further includes
4 instructions for:

5 (a3) determining if a portion of the plurality of bins causes the plurality of
6 processors to overflow; and

7 (a4) splitting each bin of the portion of the plurality of bins into two bins.

1 24. The computer-readable medium of claim 13 wherein a second portion of the
2 plurality of primitives intersects each of a portion of the plurality of variable-sized bins,
3 wherein the plurality of primitives include a plurality of fragments intersecting each pixel of
4 a portion of the plurality of pixels and wherein the rendering instructions (b) further includes
5 instructions for:

6 (b1) rendering each of the plurality of variable-sized bins pixel by pixel in raster
7 order, the plurality of fragments being provided pixel by pixel for the portion of the plurality
8 of pixels.

1 25. A system for providing a graphical image on a display, the graphical image
2 being provided from data describing a plurality of primitives, the display including a
3 plurality of pixels, the system comprising:

4 means providing a plurality of variable-sized bins containing the plurality of
5 primitives, the plurality of bins having a variable size; and

6 means, coupled with the providing means, for rendering the plurality of primitives by
7 rendering each of the plurality of variable-sized bins variable-sized bin by variable-sized bin.

1 26. The system of claim 25 wherein the system includes a plurality of processors
2 for processing a portion of the plurality of primitives in parallel, and wherein the variable-
3 sized bin providing means further includes:

4 means for storing the plurality of primitives in a plurality of bins;

5 means for determining if a part of a portion of the plurality of bins can be combined
6 without causing the plurality of processors to overflow; and

7 means for combining the part of the portion of the plurality of bins if the part of the
8 portion of the plurality of bins can be combined without causing the plurality of processors
9 to overflow;

10 wherein the plurality of variable-sized bins can include fewer bins than the plurality
11 of bins.

1 27. The system of claim 26 wherein the variable-sized bin providing means
2 further includes:

3 means for combining the part of the portion of the plurality of bins so that a
4 particular primitive of the plurality of primitives is provided only once for a corresponding
5 variable-sized bin of the plurality of variable-sized bins.

1 28. The system of claim 26 wherein the variable-sized bin providing means
2 further includes:

3 means for providing a display list containing the plurality of primitives, the display
4 list including the plurality of primitives ordered according to the plurality of variable-sized
5 bins, wherein a particular primitive of the plurality of primitives is provided to the display
6 list only once for a corresponding variable-sized bin of the plurality of variable-sized bins.

1 29. The system of claim 25 wherein the variable-sized bin providing means
2 further includes:

3 means for determining a plurality of bins for a previous frame; and

4 means for providing the plurality of bins containing the plurality of primitives.

1 30. The system of claim 29 system further including a plurality of processors for
2 processing a portion of the plurality of primitives in parallel and wherein the variable-sized
3 bin providing means further includes:

4 means for storing the plurality of primitives in the plurality of bins;

5 means for determining if a part of a portion of the plurality of bins can be combined
6 without causing the plurality of processors to overflow; and

7 means for combining the part of the portion of the plurality of bins if the portion of
8 the plurality of bins can be combined without causing the plurality of processors to
9 overflow;

10 wherein the plurality of variable-sized bins can include fewer bins than the plurality
11 of bins.

1 31. The system of claim 30 further comprising a plurality of processors for
2 processing a portion of the plurality of primitives in parallel and wherein the variable-sized
3 bin providing means further includes:

4 means for determining if a portion of the plurality of bins causes the plurality of
5 processors to overflow; and

6 means for splitting each bin of the portion of the plurality of bins into two bins.